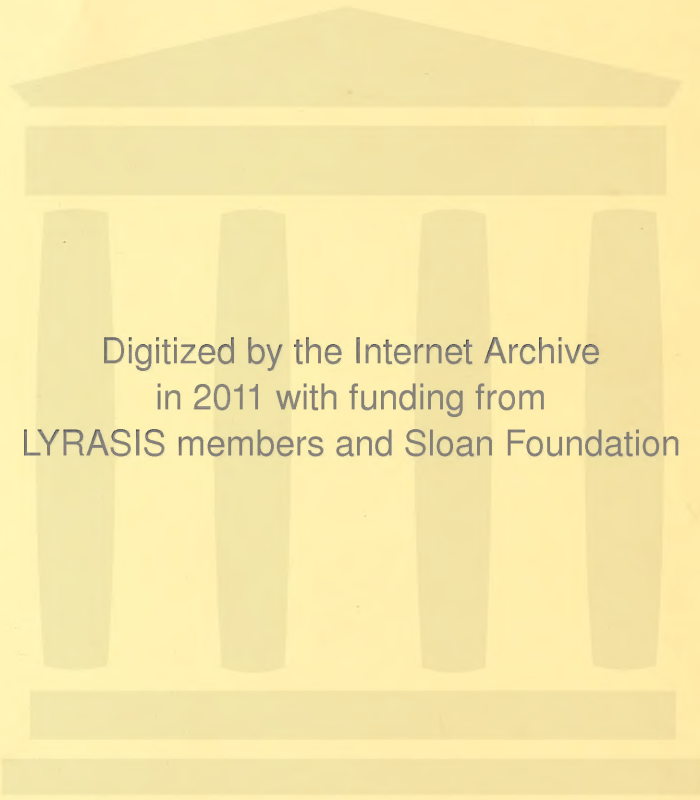


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# Connecticut Agricultural Experiment Station

E. H. JENKINS, Director

NEW HAVEN, CONN.

## SPRAY CALENDAR

## BULLETIN 183

W. E. BRITTON, Entomologist

G. P. CLINTON, Botanist

### LEAD ARSENATE

(Paste) 3 lbs., or  
(Dry) 1½ lbs.,  
50 gals. Water

Spray upon foliage to kill all chewing insects. May be used with Bordeaux or with lime-sulphur mixture.

### PARIS GREEN

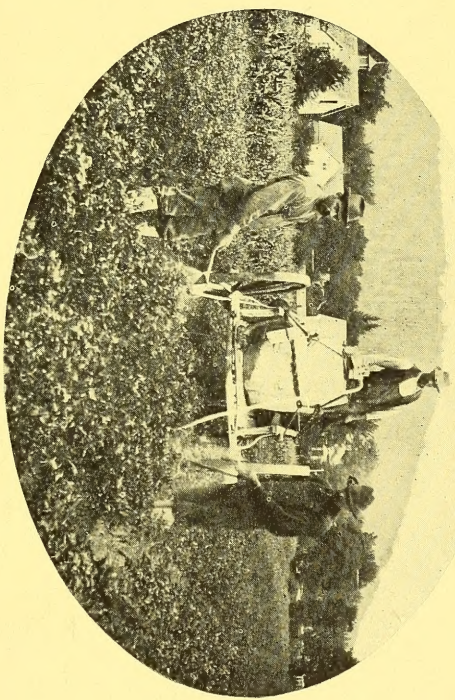
1 lb. Paris Green  
3 lbs. Lime  
100 gals. Water

Spray upon foliage to kill potato beetle, elm leaf beetle, and all biting insects. Commonly used with Bordeaux mixture.

### NICOTINE SOLUTION

½ pt. in 50 gals. Water

Several solutions are now sold containing 40% or more of nicotine. Excellent for killing aphids and other sucking insects. Add soap for a spreader.



### INSECTICIDES

### FORMULAS

### FUNGICIDES

#### COMMERCIAL LIME-SULPHUR

<i>Winter Spray</i>	<i>Summer Spray</i>
1 part L. and S.	1¼ to 1½ parts L. and S.
9 parts Water	45 to 50 parts Water

Use winter spray for San José scale and peach leaf curl; summer spray for fungi, to which, as needed, add lead arsenate to kill chewing insects.

#### BORDEAUX MIXTURE

4 lbs. Copper Sulphate  
4 lbs. Fresh Lime 45 to 50 gals. Water

Dissolve the copper sulphate in hot water or from a coarse bag suspended in cold water; slake the lime separately and strain. Dilute the latter to about 20 gals., into which pour the copper sulphate diluted to about 20 gals., stirring the mixture; dilute further to form the forty-five or fifty gallons; or dilute each to 25 gals. and pour together into barrel. Stock solutions of the copper sulphate and lime, rate, 1 lb. to 1 gal. water, can be made separately and used as needed.

#### SELF-BOILED LIME-SULPHUR

8 lbs. Fresh Whitewash  
Lime  
8 lbs. Fine Sulphur  
45 to 50 gals. Water

Start the lime slaking, sift and thoroughly stir in the sulphur, pressing just enough water to prevent burning and allow to boil from heat of lime for fifteen minutes. Then dilute and apply.

#### FORMALIN

A. 1 pt. (1 lb.) Formalin in 50 gals. water for grain smut.  
B. 1 pt. Formalin in 30 gals. water for potato scab.

C. 1 pt. Formalin in 12½ gals. water for soil treatment. Use two thirds to 1 gal. for each square foot of surface treated; cover for 24 hours after treatment; air afterwards, and stir soil, allow 7-10 days before seeding and 20-14 days before transplanting in this soil.

# MANUFACTURERS AND DEALERS IN SPRAY APPARATUS AND SUPPLIES

Prospective purchasers should write to these firms for catalogues and prices.

## MANUFACTURERS OF SPRAYING MACHINES

Aspinwall Manufacturing Co., Jackson, Mich. (hand and power potato sprayers)  
 Barnes Mfg. Co., Mansfield, Ohio (hand pumps)  
 Bateman Mfg. Co., Grenloch, N. J. (Iron Age sprayers for hand and power)  
 Bean Spray Pump Co., Cleveland, Ohio (hand and power outfits)  
 Bracket, Shaw & Lunt Co., Somersworth, N. H. (power outfits)  
 Brown Co., E. C., Rochester, N. Y. (compressed air hand and power outfits)  
 Church, Stephen B., Seymour, Conn. (power and hand sprayers)  
 Cobb Mfg. Co., 60 Glen Ave., Malden, Mass. (hand outfits)  
 Cushman Power Sprayer Co., Lincoln, Neb. (power outfits)  
 Deming Co., Salem, Ohio (hand and power outfits)  
 Deyo & Co., R. H., Binghamton, N. Y. (power)  
 Douglas, W. & B., Middletown, Conn. (power and hand outfits)  
 Field Force Pump Co., Elmira, N. Y. (hand and power pumps)  
 Fitzhurry-Guptil Co., 49 North Washington St., Boston, Mass. (high pressure power sprayers for tree work)  
 Friend Mfg. Co., Gasport, N. Y. (power and hand pumps)  
 Goulds Mfg. Co., Seneca Falls, N. Y. (hand and power sprayers)  
 Hardie Mfg. Co., Hudson, Mich. (hand and power pumps)  
 Hayes Pump and Planter Co., Galva, Ill. (power orchard sprayers)  
 Humphreys Mfg. Co., Mansfield, Ohio (hand pumps)  
 Hurst Mfg. Co., H. L., Canton, Ohio (hand and power sprayers)  
 Leggett & Brother, 301 Pearl St., New York, N. Y. (hand and power dusting machines)  
 McCormick Mfg. Co., Dayton, Ohio (hand spray pumps)  
 Morrill & Morley, Benton Harbor, Mich. (hand pumps)  
 Morris Sprayer Co., Rochester, N. Y. (compressed air power and hand pumps)  
 Myers & Brother, F. E., Ashland, Ohio (hand and power pumps)  
 Niagara Sprayer Co., Middleport, N. Y. (carbonic acid gas sprayers)  
 Pierce-Loop Co., Northeast, Pa. (compressed air power outfits)  
 Rumsey & Co., Boston, Mass. (hand and power pumps)  
 Spramotor Co., Buffalo, N. Y. (hand and power outfits)  
 Standard Harrow Co., Utica, N. Y. (power potato sprayers)  
 Wallace Machinery Co., Champaign, Ill. (power outfits for field and orchards)

Devoe, F. W., & C. T. Reynolds Co., 101 Fulton St., New York, N. Y. (arsenical poisons)  
 Frost Insecticide Co., 20 Mill St., Arlington, Mass. (spray chemicals and apparatus)  
 Grasselli Chemical Co., 60 Wall St., New York, N. Y. (insecticides and fungicides)  
 Hemingway & Co., 133 Front St., New York, N. Y. (arsenical poisons)  
 Interstate Chemical Co., 12-20 Bay View Ave., Jersey City, N. J. (insecticides and fungicides)  
 Kentucky Tobacco Product Co., Louisville, Ky. (nicotine solution)  
 Lavanburg, Fred L., 100 William St., New York, N. Y. (arsenical poisons)  
 Leggett & Brother, 301 Pearl St., New York, N. Y. (insecticides and fungicides)  
 Mechling Bros. Mfg. Co., Camden, N. J. (lime-sulphur)  
 Merrimac Chemical Co., 33 Broad St., Boston, Mass. (lime-sulphur and lead arsenate)  
 Niagara Sprayer Co., Middleport, N. Y. (lime-sulphur and lead arsenate)  
 Powers-Weightman-Rosengarten Co., Philadelphia, Pa. (lead arsenate)  
 Pratt Co., B. G., 50 Church St., New York, N. Y. (miscible oils, arsenical poisons and fungicides)  
 Roessler & Hasslacher Chemical Co., 100 William St., New York, N. Y. (cyanide)  
 Sherwin-Williams Co., 601 Canal Road, Cleveland, Ohio (lime-sulphur and arsenical poisons)  
 Taylor, E. R., Penn Yan, N. Y. (carbon disulphide)  
 Thomsen Chemical Co., Baltimore, Md. (general insecticides and fungicides)  
 Thum Co., O. & W., Grand Rapids, Mich. (Tanglefoot)  
 Vreeland Chemical Co., 50 Church St., New York, N. Y. (arsenical poisons)

## CONNECTICUT DEALERS IN SPRAYING SUPPLIES

Dealers in spraying materials can usually be found in each town. Some of the larger firms are mentioned below.

Apothecaries Hall Co., 24 Benedict St., Waterbury (wholesale druggists)  
 Cadwell & Jones, 1084 Main St., Hartford (pumps, insecticides and fungicides)  
 Frost & Bartlett Co., 570 Main St., Stamford (pumps, insecticides and fungicides)

1915

## CALENDAR

1915

## JANUARY

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24 31	25	26	27	28	29	30

## APRIL

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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## JULY

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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18	19	20	21	22	23	24
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## OCTOBER

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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17	18	19	20	21	22	23
24 31	25	26	27	28	29	30

## FEBRUARY

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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14	15	16	17	18	19	20
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28						

## MAY

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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## AUGUST

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29	30	31				

## NOVEMBER

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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28	29	30				

## MARCH

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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## JUNE

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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## SEPTEMBER

SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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## DECEMBER

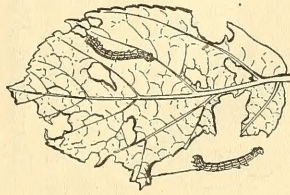
SUN.	MON.	TUES.	WED.	THUR.	FRI.	SAT.
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## APPLE

Insects, etc.

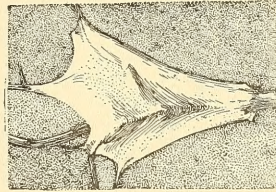
**Bud-Moths: Case Bearers: Leaf Crumpler**—Small overwintering caterpillars feed upon the unfolding leaves. Spray with lead arsenate as soon as leaf buds begin to open. Repeat a few days later. Rep. 1909, p. 353.



**Canker-Worms**—During May small looping caterpillars devour the leaves and spin down on threads when disturbed. Spray foliage with lead arsenate before blossoms open, and again soon after they fall. In unsprayed orchards sticky tangle-foot bands should be placed around trunks of trees in October, kept sticky until January 1st, and again during April and May. Rep. 1908, p. 777!

**Tent-Caterpillar**—During May the caterpillars form nests at the forks of the branches, and devour the leaves. Clip off and burn egg-masses on twigs in winter. Remove nests with caterpillar brush. Spray with lead arsenate once before the blossoms open, and again soon after they fall. Bull. 177, and Rep. 1913, p. 226.

**Lesser Apple Worm**—Larva feeds on exterior of nearly mature fruit, and often causes injury in storage. Spray as for Codling-Moth. Rep. 1910, p. 595.



**Codling-Moth or Apple-Worm**—Pink caterpillar tunnels inside the fruit, especially around the core. Spray with lead arsenate as soon as the blossoms fall. Repeat three or four weeks later. Keep foliage and fruit covered until fruit is nearly grown. Rep. 1910, p. 594.

**Brown-Tail Moth: Fall Web-Worm**—See Pear.

**Gypsy Moth**—Caterpillars defoliate trees in May and June. Band trees with tanglefoot, and with burlap, which should be examined each day to destroy caterpillars. From August to May, egg-masses can be destroyed by soaking them with creosote. Spray foliage with lead arsenate. Rep. 1905, p. 246; 1906, p. 235; 1907, p. 300, also placard.

**Curculios**—Grubs of both apple and plum curculios tunnel inside the fruit, making it gnarled and ill-shaped. Spray twice after blossoms fall as for Codling-Moth. Rep. 1904, p. 219.

**Green Fruit Worms: Palmer Worm: Leaf Roller**—Caterpillars all feed upon foliage and immature fruit. Spray with lead arsenate, as for Codling-Moth.

**Tussock Moths**—Tufted caterpillars of several species feed upon the leaves in mid-summer. Spray with lead arsenate as for Codling-Moth. Reps. 1905, p. 230; 1907, p. 332.

**Yellow-necked Caterpillar:** Red-humped Caterpillar—Feed in clusters and often strip young trees in fall. Hand-picking is easy method of control. Spray leaves with lead arsenate.

**Maggot, or Railroad Worm**—Maggots tunnel through the pulp of the ripening fruit of sweet and sub-acid varieties, especially those ripening early in the season. Destroy all infested fruit. Rep. 1910, p. 593.

**Green and Rosy Aphids**—Green aphids suck sap from the leaves and terminal shoots, causing leaves to curl and checking growth. Rosy aphids infests fruit clusters, checking development. Spray with nicotine solution ( $\frac{1}{2}$  pint in 50 gallons water). Reps. 1903, p. 259; 1909, p. 343.

**Red-Bugs**—Two species of red leaf-bugs suck the sap, causing leaves and fruit to become distorted. Spray with nicotine solution, as for aphids.

**Leaf Hoppers**—Whitish insects sucking sap from under side of leaves. Spray with nicotine solution, as for aphids.

**Tarnished Plant Bug**—Injures developing fruit by sucking sap, forming dimples. Spray with nicotine solution as for aphids.

**Red Spider: Clover Mite**—Cause much injury to leaves, especially in dry seasons. Spray with kerosene emulsion or nicotine solution as summer treatment. Eggs of latter species killed by lime-sulphur spray in winter.

**Leaf-Blister Mite**—See Pear.

**San Jose Scale**—See Peach. Spray dormant trees with lime sulphur or miscible oil. Bull. 165; Rep. 1904, p. 221.

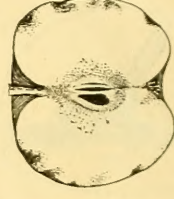
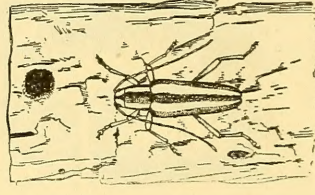
**Oyster Shell Scale: Scurfy Scale**—Scale insects with elongated or pear-shaped shells, on bark, sucking sap from the twigs. Spray with nicotine solution; soap and water; or kerosene emulsion, about the second week in June. Bull. 143; Rep. 1903, p. 225.

**Round-Headed Borer:** Flat-Headed Borer—Grubs burrow in wood at base of trunks. Watch trees and dig out borers wherever sawdust appears. Paint trunk with lead arsenate and lime-sulphur. Rep. 1907, p. 333.

**Woolly Apple Aphis**—A bluish-white cottony plant louse in colonies on bark, forming galls or swellings on twigs of small trees and preventing wounds from healing; also on roots, forming galls, and small feeding roots are destroyed. Plant only clean or fumigated stock. Use tobacco dust in soil around trees. Spray above ground with kerosene emulsion.

**Fungi, etc.**

**Baldwin Spot**—Shows as small diseased masses of brownish tissue, usually a short



distance beneath the skin, but finally may appear at the surface as small discolored, shrunken areas, very similar to some of the Fruit Speck troubles. Not a fungous, but apparently a physiological disease. Thought by some to be due to unusual local loss of water; possibly may start from punctures of Rosy Aphis or similar puncturing insects. No remedy known.

**Black Rot**—Causes mature fruit to rot, eventually turning it black; forms small brown spots on leaves; does serious damage through cankers on branches, which are eventually killed. Treat as for Scab; prune and burn all dead limbs and twigs; cut out and paint over large cankers when found. Rep. 1909-10, p. 590.

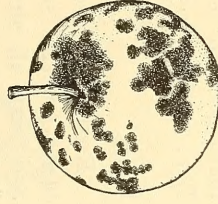
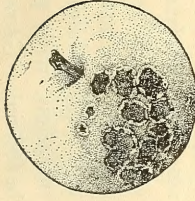
**Blight.** See Pear.

**Fruit Specks**—Form more or less numerous, small brown or black spots, starting at surface of fruit and slowly working inward; the true Fruit Spot often has a pinkish or purplish border in light-skinned varieties. Due to various fungi. Usually controlled by spraying as for Scab. Rep. 1909-10, p. 590.

**Rust**—Shows as orange-colored blotches on leaves, eventually producing minute fringed clustered cups imbedded on the under side; less frequent on fruit. Rust spreads to the apple from the *cedar apples*, which appear in the early spring on the red cedar. All cedars near the orchard should be destroyed. There is great difference in the susceptibility of different varieties to this disease. Spraying is only partially successful in this state, as the leaves must be well coated continuously with spray from the time they begin to unfold until the end of July. Reps. 1891, p. 161; 1909-10, p. 591.

**Scab**—Produces "scabby spots" on fruit and leaves; rarely on twigs. Spray the unfolding leaves before the blossoms open, again after the petals fall, and follow with a third spraying about four weeks later. For first treatment, use strong Bordeaux, for second and third, weak Bordeaux or lime-sulphur. Rep. 1909-10, p. 591.

**Sooty Blotch**—Forms on fruit an olive-black superficial growth in distinct round colonies, or often merging together. Spray with Bordeaux as for Scab, or with lime-sulphur  $1\frac{1}{2}$  to 50. Reps. 1909-10, p. 592; 1911, p. 367.



### *General Treatment for Apple Orchards*

For the general control of fungi and insects on apples in Connecticut we make the following recommendations:

(1) Winter treatment (spraying dormant trees) is necessary only in the case of the presence of the San José scale, or leaf-blister mite, when commercial lime-sulphur, 1-9, or miscible oils, 1-15, may be used.

(2) As a rule, three summer treatments with a fungicide are necessary to control the fungous diseases, and the last two of these should contain an insecticide. These sprayings should be made as follows: 1st, just before the blossoms open, on the young unfolding leaves (April 27th to May 10th, according to

the season and variety); 2d, so soon as all the blossoms have fallen (May 10th to 30th); 3d, about one month later (usually June 10th to 25th).

(3) Where fungi are not prevalent, especially scab, the first summer treatment may be omitted. Occasionally, perhaps in alternative years, where fungi are quite inconspicuous and the trees have been thoroughly sprayed the previous year, the fungicide may be entirely omitted, and only the two sprayings for insects given.

(4) For fungicides, we recommend Bordeaux mixture of the 4-4-50 strength for the first spraying, and of the 1-4-50 for the second and third sprayings; or commercial lime-sulphur, used at a strength of  $1\frac{1}{4}$  to  $1\frac{1}{2}$  gallons per fifty gallons of water, for all three sprayings. The former has better fungicidal value, and the latter is less likely to produce spray injury, especially russetting of the fruit. Where fungi are prevalent, the former might be used, while with varieties russetting badly, as Baldwin, the latter is likely to prove more satisfactory; or use strong Bordeaux for first spraying and lime-sulphur for second and third.

(5) For the insecticide in the above, use lead arsenate, if in the paste form at the rate of three pounds per fifty gallons of the mixture, or if in the powder form one and one-half pounds per fifty gallons.

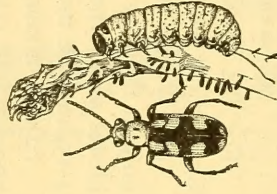
(6) If canker worms, tent-caterpillar, bud-moth, or brown-tail moth are present and causing damage, add lead arsenate to the first summer treatment, and if aphids are present nicotine solution should also be included. Nicotine solution may be added

to any of the subsequent treatments to destroy aphids, red bugs, tarnished plant bug, etc.

## ASPARAGUS

### Insects

**Asparagus Beetles, Common and 12-Spotted**—Adults and larvæ devour the foliage. Cut everything clean during the cutting season; afterward spray with lead arsenate. Reps. 1907, p. 172 and 1903, p. 276.



**Asparagus Miner**—Larvæ tunnel under epidermis of stem near base, causing premature death of plant above ground. Burn infested stalks. Rep. 1906, p. 303.

### Fungi

**Rust**—Produces (most conspicuous stages) small reddish or black pustules scattered over stems. In fall carefully gather and burn all stems from affected beds and escaped plants in vicinity. In gathering for market cut below the ground, as protruding stems offer opportunity for development of first stage of the fungus. Spraying with Resin Bordeaux partially controls the disease, but this is difficult and expensive. Begin spraying the latter part of July and repeat about every 10 days until the middle of September. Thorough cultivation and fertilization, with plenty of humus in the soil, are advocated as beneficial. Grow varieties most resistant to the disease and select

seed for new stock from resistant individuals if found. Reps. 1896, p. 281; 1904, p. 313.

## BEAN

### Insects.

**Green Clover Worm**—Occasionally the caterpillars attack and riddle the leaves in June and July. Dust string beans with air-slaked lime or other fine powder. Spray shell beans with lead arsenate. Rep. 1908, p. 828.



**Weevils**—Adults lay eggs in the pods in the field and continue to breed in the dried seed, finally rendering it unfit for food or for planting. Fumigate the seed with carbon disulphide.

### Fungi.

**Anthraxnose**—Shows on leaves and pods as roundish discolored areas, often with a purplish border. Select only sound seed for planting and destroy all infected seedlings. Where very troublesome, spray with Bordeaux, beginning when plants are only a few inches high and repeating about every 10 to 14 days until pods are forming. Rotation and destruction of old vines may prove helpful in keeping the trouble in check.

**Blight**—Appears much like anthracnose, but with discolored areas usually having more of a translucent or watery character. Treat same as anthracnose. Reps. 1898, p. 262; 1903, p. 307.

**Downy Mildew**—Forms dense white woolly growths on pods and less luxuriantly on young stems and leaves of the Lima

bean. As the fungus usually appears first and most vigorously in low, moist places, the land used should be high or well drained. Serious only in years unusually moist after the middle of July. Spray with Bordeaux, beginning about the middle of July, and repeat every 10-14 days until the first part of September. Rep. 1905, p. 278.

**Rust**—Produces small, round, reddish or black dusty outbreaks, usually on the leaves. Plant varieties not likely to rust. Burn the old infected plants in the fall. Rep. 1903, p. 308.

## BEET—SWISS CHARD

### Insects.

**Leaf-Miner**—A small fly lays eggs in the leaves, and the larvæ tunnel or mine between upper and lower surfaces. Practice clean cultivation. Destroy all infested leaves. Destroy all plants of the weed known as "lamb's quarters" in which this insect breeds. Practice late fall plowing.

## BIRCH

### Insects.

**Birch Leaf Skeletonizer or Birch Bucculatrix**—Small greenish yellow larvæ feed upon both sides of the leaves in late summer, often entirely defoliating the trees. Spray with lead arsenate in July. Rep. 1910, p. 701.

**Bronze Birch Borer**—Grub makes spiral tunnel just beneath bark of upper main branches, ridges showing on outside. Cut and burn infested trees before May 1st.

## BLACKBERRY

### Insects.

**Blackberry Crown Borer**—Larva tunnels in roots and at base of stem. Dig out and destroy.

**Red-Necked Cane Borer**—Larva tunnels in canes causing an irregular swelling or gall, often three inches in length. Cut and burn all infested canes in fall, winter, or spring.

**Blackberry Leaf Miner**—Larva of a sawfly mines in the leaves. Spray with nicotine solution.

**Blackberry Sawfly**—Larvæ devour leaves in June and first part of July. Spray about June 15th with lead arsenate. Rep. 1912, p. 236.

### Fungi, etc.

**Crown Gall**—Forms hard galls or irregular excrescences on roots and lower parts of stems of blackberries, raspberries and several other hosts. Dig out and burn affected plants as soon as discovered. Never use infected stock for transplanting. A bacterial trouble. Rep. 1903, p. 354.

**Leaf Spot**—Forms on leaves small circular spots with a whitish center and purplish border; also occurs on dewberry and raspberry. This is not usually serious but where necessary it probably can be controlled by Bordeaux applied to the leaves, beginning before they have reached their full size. Rep. 1903, p. 309.

**Orange Rust**—Breaks out in spring or early summer as dusty masses of bright orange spores over the under side of the leaves. The fungus is perennial in the underground parts of the host, so that the disease appears year after year. As soon as infected plant is found dig up and burn it. Rep. 1903, p. 309.

## CABBAGE—CAULIFLOWER

### Insects.

**Cabbage Worm**—Green worms feed upon leaves all through season. Spray unheaded plants with lead arsenate. Use Pyrethrum or insect powder on headed plants. Rep. 1903, p. 271.

**Cabbage-Looper**—A smooth looping caterpillar feeding with cabbage worms in late summer, and requiring same treatment. Rep. 1910, p. 706.

**Cabbage Aphis**—Sucks sap from the leaves. Spray with nicotine solution or kerosene emulsion.

**Cabbage Maggot**—Infests stems of early set plants near surface of ground, checking growth and often killing them. Practice crop rotation. Place hexagonal tarred paper disks around stems at setting time. Treat with carbolic acid emulsion. Rep. 1908, p. 832; 1914.



Fungi, etc.



**Black Rot, Bacterial**—Forms black lines in veins of leaves. In time leaves turn yellow and easily drop off, and interior of head develops a general soft rot. As the germs can be carried on the seed, avoid seed from infected fields. If in doubt, treat seed in formalin 1 part to 240 of water for 15 minutes. Keep refuse from diseased plants out of manure; practice rotation; make seed bed in new soil if disease appeared in old one. Rep. 1912, p. 345.

**Club Root**—Causes knob-like enlargements on the roots of cabbage and allied plants. The disease germ often becomes established in the soil; when possible, avoid such land and the use of refuse from old plants on the soil. Be especially careful that the seed bed is not infected.

Infected land, when used, should be treated in the fall with lime broadcast at the rate of 80 bushels per acre and then worked in. Rep. 1903, p. 310.



## CARNATION

Insects.

**Green Fly or Aphis**—Sucks sap from young leaves and buds. Fumigate greenhouse with tobacco, or spray with nicotine solution or with soap and water.

Fungi.

**Leaf Mold and Leaf Spot**—Two troubles much alike in appearance, producing grayish spots with colored borders, on stem, leaves and calyx. Treat as for Rust.

**Rust**—Produces small dusty pustules, more or less confluent, on the leaves and stems. Select, if feasible, only rust-resisting varieties. Spray in field with Bordeaux, adding 1½ lbs. soap to each 50 gallons (helps mixture to adhere to plants). Select for transplanting only hardy and, if possible, rust-free specimens. Keep air of greenhouse as dry as is consistent with good growth. One or two sprayings with Soap- or Resin-Bordeaux, after transplanting in greenhouse, may be given if desired; for repeated spraying, potassium sulphide or weak copper sulphate may be used. Rep. 1903, p. 312.

**Stem Rot and Wilt**—Cause the lower leaves first to turn yellow and dry up; then as the stem gradually rots off at its base, the whole plant becomes affected and finally dies. Select cuttings only from perfectly healthy plants, and if necessary start these in sterilized soil and replant out of doors in new land, avoiding excessive use of manure. If disease appears only after setting out in greenhouse, pull up infected plants upon appearance of first symptoms, make liberal application of lime, avoid over-watering, and see that roots are properly aerated. Reps. 1897, p. 175; 1903, p. 312.

## CELERY

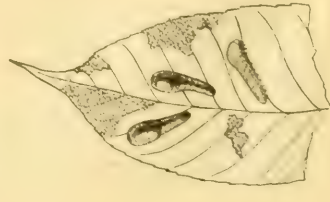
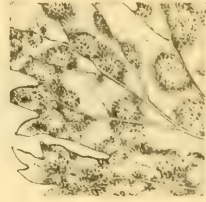
Insects.

**Celery Caterpillar**—Feeds upon the leaves of celery, parsley,

carrot and parsnip. On the latter two plants lead arsenate may be used. On celery and parsley handpicking is perhaps the best remedy.

Fungi.

**Leaf Blight and Leaf Spot**—Two diseases producing "rusty" spots on leaves and petioles; the latter trouble distinguished by the very minute black dots in the discolored spots (fig.), often progressing in stalks after storage. Spray the plants thoroughly in the seed bed with Bordeaux, as infected plants are usually the means of introducing the trouble in the field. If necessary, also continue the spraying after transplanting at intervals of about two weeks up to the middle of September. Before covering for bleaching, if leaf spot is found, dust with sulphur, and before final storage remove infested leaves and dust again. Rep. 1897, p. 167.



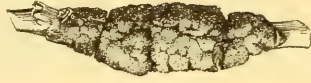
**Cherry Maggots or Fruit Flies**—Larvæ of two species infest maturing fruit. Sprinkle foliage with sweetened lead arsenate in early June to kill the adult flies.

**Plum Curculio**—See Plum.

**Cherry Aphis**—A brown plant louse which sucks sap from under side of leaves causing them to curl. Spray with nicotine solution; soap and water; or kerosene emulsion.

Fungi.

**Black Knot**—Forms knot-like excrescences, usually several inches long, on twigs and branches. When planting, use only trees free from this trouble; in the orchard, cut off and burn all infected branches in late fall or winter, painting over large cut surfaces. Cutting out knots is rarely advisable, as new outbreaks usually result. In cutting off, cut several inches below the knot, to insure removal of the mycelial threads in the tissues. Keep up removal of all knots each year until they fail entirely to reappear. Spraying in spring and early summer with self-boiled lime-sulphur or atomic sulphur helps to keep new knots from fruiting, but is entirely secondary in importance to the removal of the knots. Rep. 1911, p. 399.



**Brown Rot**—See Plum. Rep. 1911, p. 402.

**Leaf Spot**—Shows as numerous closely-placed purplish spots on leaves, which often have "shot-holes." Spraying, if begun

## CHERRY

Insects.

**Cherry or Pear Slug**—Larvæ eat away the green tissue from upper side of leaf. Spray with lead arsenate or with hellebore.

on young leaves, early in May, is effective in preventing this disease, but use the dilute Bordeaux, or better still, self-boiled lime-sulphur, to avoid injury to the foliage. Give several sprayings at intervals of two weeks. This helps to keep down the brown rot also. Reps. 1895, p. 188; 1911, p. 401.

**Powdery Mildew**—Develops a cobweb-like growth over the leaves; in fall forms numerous, minute, black, fruiting bodies, especially on under surfaces. This disease, usually worst in young trees, is controlled by spraying if necessary.

## CHESTNUT

Insects.

**Canker Worms**—See Apple.

**Two-Lined Chestnut Borer**—Long, slender, flat-headed larvæ make sinuous tunnels under bark of weakened chestnut and oak trees. Badly infested trees should be removed and burned, or at least the bark removed before the insects can mature and spread to other trees.

Fungi.

**Bark Disease (Blight)**—Forms cankers in the bark that eventually girdle the infected limb and cause death of parts above. Spreads over the tree so that usually it dies within two to five years. Rarely shade trees can be saved by carefully cutting out and painting over the cankers. For forest trees it is best to



let the disease take its course, and remove at least the larger trees within a year or two after their death, to prevent deterioration of the wood. Rep. 1912, p. 359; Bull. 178.

## CHRYSANthemUM

Insects.

**Black Fly or Aphis**—Sucks the juice from the young leaves and flower stems. Fumigate the house with tobacco, dip the plants in or spray them with soap and water or nicotine solution. Fungi.

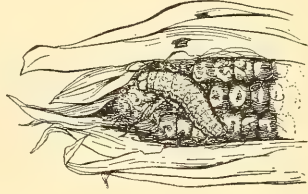
**Powdery Mildew**—Develops a white mealy or cobweb coating on leaves. Use good judgment in airing and watering, and if necessary, spray from time to time with potassium sulphide or paint heating pipes with sulphur.

**Rust**—Appears as dusty reddish-brown outbreaks, about the size of a pin head, chiefly on under sides of leaves. Avoid worst-rusting varieties. Start with cuttings free from rust if possible. Destroy rusted leaves, especially on cuttings. Early sprayings with dilute copper sulphate, potassium sulphide, etc., may help to prevent the trouble from getting a start. Rep. 1903, p. 315.

## CORN

Insects.

**Corn Ear Worm**—Eats the immature kernels at the end of the ear. Dust with equal parts sulphur and powdered lead arsenate.



**Army Worm**—See Grass.  
**Cut Worms**—See Tomato.

**Fungi.**

**Smut**—Forms black, dusty outbreaks that appear on various parts of the plant. It is especially injurious to certain varieties of sweet corn. Avoid the use of *fresh* manure on the land. Seed treatment is ineffective. The removal and destruction of the spore masses is recommended by some writers.



**CUCUMBER**

**Insects.**

**Striped Cucumber Beetle**—Attacks young plants, eating the leaves. Larvæ infest the main root or stem under ground, often killing the plant. Dust leaves with dry lead arsenate. Cover plants with screens. Rep. 1908, p. 807.



**Aphis or Louse**—See Melon.

**Fungi.**

**Anthraxnose**—Produces prominent discolored spots, more or less merged, on leaves; also occurs occasionally on fruit. Treatment is the same as for mildew.

**Downy Mildew**—Forms discolored spots as in preceding, but beneath shows a minute thin growth of upright threads bearing

dark colored spores. Repeated sprayings with Bordeaux about every 10 to 14 days during the season, beginning at least by middle of July, usually keep this disease in check. The same fungus also occurs on melon. Rep. 1904, p. 329.

**Wilt**—See Squash.

**CURRENT**

**Insects.**

**Current Worm**—Devours foliage in May. Spray with hellebore or lead arsenate. Rep. 1902, p. 170.

**San José Scale**—See Apple.

**Scurfy Scale**—A conspicuous pear-shaped light-gray scale on bark, the insect sucking sap from twigs. Spray about second week in June with kerosene emulsion or nicotine solution. Bull. 143; Rep. 1903, p. 227.

**Current Aphis**—Yellowish-green plant lice on under side of leaves causing them to curl. Underspray with nicotine solution or kerosene emulsion.

**Four-Lined Leaf-Bug**—A yellow and black striped bug sucking sap from the leaves. Spray with nicotine solution.

**Current Borers**—The larvæ of two species of insects tunnel in the pith of the stems, causing the leaves to droop and wilt. Destroy infested canes during May.

**Current Stem Girdler**—Adults cut or girdle tip of new shoots after laying eggs in them. Cut and burn these tips at any time of year. Rep. 1896, p. 238.

#### Fungi.



**Anthracnose and Leaf Spots**—Cause spots on the leaves and usually their premature shedding; the former spots the fruit of certain varieties. Spray with Bordeaux as the leaves unfold, and repeat at intervals of 10 to 14 days until fruit begins to turn. If necessary continue spraying after harvest. Rake up and burn leaves in fall.

**Rust**—Shows in first stage as dusty orange-colored outbreaks about size of pinhead on lower surface of leaves, and in second stage as short hair-like growths. Worst on black currants. Alternate host is white pine. See Pine.

### DAHLIA

#### Insects.

**Tarnished Plant Bug**—Punctures the tissues and sucks the sap from the developing buds, causing them to "blast" and fall. Spray with nicotine solution. Rep. 1904, p. 218.

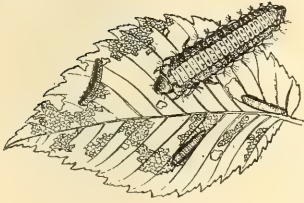
**Stalk Borer**—Larva tunnels up and down inside the main stem, the top portion usually wilting and dying. Carefully make longitudinal slit in the stem and kill the borer.

### ELM

#### Insects.

**Spiny Elm Caterpillar**—Clusters of black spiny caterpillars often strip certain branches of elm, willow, and poplar. Remove and destroy entire cluster or spray with lead arsenate. Rep. 1906, p. 260.

**Elm Leaf Beetle**—Adult beetles eat holes through the leaves in May, and in June and July the larvæ or grubs eat away the green tissues from the under surface. Spray with lead arsenate early in May to kill egg-laying beetles, or spray under surface of leaves with same mixture about June 1st, to kill the larvæ. Yellow pupæ at base of trees may be killed with kerosene emulsion or soap and water. Bull. 155; Rep. 1908, p. 815.



**Leopard Moth**—Larva tunnels in branches under the bark, cutting deep galleries, often crossing the grain and girdling the branch, which later breaks off and falls to the ground. Small trees may be examined and borers killed by injecting carbon disulphide, or by inserting a wire. Bull. 169.

**Elm Scale**—A large brown soft scale, oval in shape with cottony marginal fringe, located especially in the cracks of the bark of trunk and lower branches, sucking the sap. Spray with kerosene emulsion. Bull. 151; Rep. 1905, p. 235.

### EUONYMUS

#### Insects.

**Euonymus Scale**—The various species of *Euonymus* are attacked and often injured by this scale, which has narrow white (male) or pear-shaped gray or brown (female) shells. Cut and burn infested twigs. Cover and fumigate with hydrocyanic acid

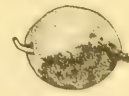
gas. Spray with nicotine solution during June to kill young. Bull. 151; Rep. 1905, p. 240.

## GOOSEBERRY

Insects.

**Currant-Worm**—Devours foliage. Apply hellebore or lead arsenate early in season. Rep. 1902, p. 170.

**Gooseberry Fruit-Worm**—Feeds inside the berry. Destroy infested berries.



Fungi.

**Mildew**—Forms a felt-like growth on fruit and leaves of young shoots. Worst on European varieties. Also attacks current, especially young shoots. Spray with potassium sulphide or other sulphur spray as soon as buds break, and repeat about every 10 days until the end of June.

## GRAPE

Insects.

**Grape Vine Flea Beetle**—Adults and larvæ devour the leaves. Spray with lead arsenate the latter part of June.

**Rose Chafer**—Adult beetles appear about June 15th and feed upon leaves, flowers and newly set fruit, often doing great damage. Spray with sweetened lead arsenate.

**Grape Plume Moth**—Small green spiny caterpillars web together the newly-formed leaves at the tips of new shoots.

Damage more apparent than real. Crushing by pinching these leaves is best remedy.

**Grape Root Worm**—Adult beetles eat chain-like holes in leaves in July, and larvæ or grubs devour the small feeding roots and eat channels in the bark of the larger roots and main stem underground, often causing great injury. Spray leaves with lead arsenate.

**Grape Berry Moth**—Larva feeds and develops inside the berries and is the cause of most wormy grapes. Spray with lead arsenate soon after fruit sets, and repeat twice at intervals of about ten days. Bag the clusters soon after the fruit sets.

**Sphinx and Other Caterpillars**—Several species of horn worms as well as other kinds of caterpillars feed upon the leaves. Spray with lead arsenate or practice hand picking.

**Grape Leaf-Hopper**—Small yellow and red-marked leaf-hoppers sucking sap from under side of leaves. Spray under surface with nicotine solution.

**Grape Phylloxera**—A plant louse sucking sap from roots and leaves, forming galls, and causing serious injury to European varieties. Graft on native species.

Fungi.

**Black Rot**—Causes reddish-brown spots on leaves; more rarely on stems; especially bad in rotting the berries, which finally become hard, shrunken and wrinkled black mummies. This is one of the worst diseases of the grape and often difficult to control by spraying, which must be thorough, especially the first season. Begin spraying before blossoming time, about the



last of May, with second application just after blossoming and subsequent sprayings at intervals of about 10-14 days. Use Bordeaux up to the last of July and then change to soda Bordeaux or Amm. Sol. Cop. carbonate, though usually the 4 or 5 sprayings with Bordeaux are sufficient. Reps. 1889, p. 174; 1890, p. 100.

**Downy Mildew**—Develops usually dense white patches of fungus threads on under side of leaves and causes more or less discoloration on the upper; also occurs somewhat on stems and fruit. Treat the same as for black rot. Rep. 1893, p. 77.

**Gray Mold**—Causes rotting of ripening greenhouse grapes, covering them with a more or less conspicuous grayish mat of fruiting threads. Remove rotting grapes from the house. Use care in ventilating and watering. If necessary, spray bunches several times with potassium sulphide.

**Powdery Mildew**—Produces a cobweb-like growth over upper surface of leaves; most conspicuous in the fall, when the small, round, yellowish to black fruiting bodies are found scattered over surface. Treat as for black rot. Potassium sulphide is also used effectively against this fungus. Rep. 1895, p. 185.

## GRASS

### Insects.

**Army Worm**—In certain seasons grasses and grains are stripped of leaves and heads during July by brown striped



caterpillars, which when abundant move like armies from one field to another often causing great damage. Spray with lead arsenate, strips of grass or grain to protect fields not attacked. Plow deep furrows across line of march. Sprinkle migrating worms with kerosene. Use poisoned bran mash. Rep. 1914.

**Fall Army Worm**—Attack similar to that of army worm but occurs in September instead of July and is more apt to be confined to lawns and millet. The worm does not migrate in such great numbers from one field to another. Same remedies apply. Also practice late fall plowing. Rep. 1912, p. 284.



**White Grubs**—White grubs are the larvæ of June beetles, and when abundant in the soil and approaching maturity, cause much damage, especially in seasons following drought, by eating off the roots of grass, corn, strawberries, etc. Practice fall plowing to expose insects. Harrow very thoroughly before planting. Rep. 1912, p. 288.

### Insects.

## HICKORY

**Hickory Bark-Beetle**—Small black beetles breed under bark and the brood galleries soon girdle the tree. Adults emerge

leaving numerous round holes as if the bark had received a charge of bird shot. Beetles also feed at base of compound leaf stems causing them to break and fall in midsummer. Has killed thousands of trees in Atlantic States. Badly infested trees should be removed before May 1st, and burned, or at least the bark removed. Spray healthy and slightly infested trees about June 1st, with strong lead arsenate and nicotine solution. Rep. 1901, p. 267.

**Hickory Borer**—Larvæ tunnel deep into solid wood of trunk. Hunt for sawdust, find the burrow, inject carbon disulphide, and plug the entrance.

## HOLLYHOCK

Fungi.

**Rust**—Appears as small, compact, reddish-brown outbreaks on both leaves and stems. After their death in fall, cut off the plants close to the ground and carefully gather up these, and any rubbish that may contain spores, and destroy them. Spraying with Bordeaux is recommended by some as helpful in checking the rust; begin as plants push through ground. Rep. 1895, p. 188.

## HORSE CHESTNUT

Insects.

**White-Marked Tussock Moth**—Tufted caterpillars devour leaves in midsummer. Spray with lead arsenate. Rep. 1905, p. 230.

Fungi.

**Leaf Spot**—Forms usually extended, reddish-brown areas on the leaves, frequently resembling sun scorch, but showing the fruiting stage as minute black dots in the dead tissues. This trouble can no doubt be controlled by spraying with Bordeaux, if the first application is made on the unfolding leaves and is followed by one or two subsequently on the mature leaves.

## LETTUCE

Insects.

**Aphis or Green-Fly**—Sucks sap from leaves. Fumigate with tobacco or hydrocyanic acid gas. Spray with soap and water.

Fungi,

**Leaf Mold and Mildew**—The first produces a brownish and the second a white moldy growth in spots on the leaves. These diseases are held in check by sub-irrigation or care in watering and ventilating to keep plants and atmosphere as free from moisture as is consistent with good growth.

**Drop**—Causes sudden wilting of plants by infecting and rotting off leaves at surface of soil; often shows a white moldy growth over the basal parts. This may develop into a serious trouble in the greenhouse, as the fungus often becomes established in the soil, when the best remedy is to change the soil entirely or sterilize it by steam or formalin



(formula C). Treat some days before using. Parsley is also subject to this disease in the greenhouse. Rep. 1908, p. 863.

## LILY

### Insects.

**Aphis**—Yellow plant lice with red markings on under side of leaves. Spray with nicotine solution.

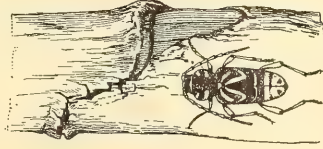
**Stalk Borer**—See Dahlia.

## MAPLE

### Insects.

**Maple Borer**—Larva tunnels in spiral course upward around trunk or larger branches of sugar maple, working in sap-wood and cambium, often girdling the trees. Examine trees in September for sawdust. Find the burrow, inject carbon disulphide and plug the opening. Rep. 1907, p. 336.

**Woolly Maple Leaf Scale**—Cottony or woolly masses of wax, containing the females, eggs and sometimes larvæ, appear on the under side of the leaves in mid-summer; insects suck out the sap causing leaves to fall prematurely. Males and larvæ enter crevices of bark of trunk and branches; larvæ make cases here and pass the winter. Attacks only sugar maples.



Spray dormant trees with nicotine solution and soap. Burn all infested leaves. Bull. 151; Reps. 1905, p. 226; 1912, p. 345.

**Cottony Maple Scale**—Large, oval, brown, soft scales on bark of branches of silver and red maples. Each scale in early summer develops a large cotton-like tuft of wax, nearly half an inch long, and soon after the young appear. Spray with miscible oils. Bull. 151; Reps. 1905, p. 237; 1913, p. 252.

**Terrapin Scale**—Small reddish-brown soft scales on small twigs of silver and red maples, sometimes killing the branches. Spray with kerosene emulsion. Bull. 151; Rep. 1905, p. 238.

### Fungi, etc.

**Black Spot**—Forms slightly thickened black spots on the leaves, resembling finger prints. Cut-leaf maples are especially susceptible. Rake up and burn all leaves in the fall. Rep. 1908, p. 852.

**Leaf Scorch**—Causes more or less extended and irregular dead areas to appear suddenly, usually from the leaf margins inward. A physiological trouble due to sudden or excessive evaporation beyond the supply of water furnished by the roots, which is in turn due to abrupt changes in atmospheric conditions, drought, injury to roots, etc. Pruning when necessary, watering or mulching, and stimulating root growth by nitrogenous fertilizers, are probably best remedial measures. Rep. 1905, p. 267.

## MELON

### Insects.

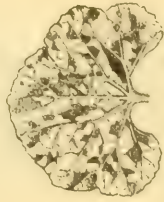
**Melon Aphis or Louse**—Sucks the sap from the under side of the leaves, and when abundant causes much damage.

Underspray the leaves with nicotine solution. Rep. 1908, p. 813.

**Striped Cucumber Beetle**—See Cucumber.

**Fungi.**

**Leaf Mold**—Develops dead spots on the leaves very similar to those caused by downy mildew. Spray with Bordeaux on the first running vines and repeat every 10 to 14 days, making 4 or 5 applications according to season. Reps. 1895, p. 186; 1898, p. 225.



**Downy Mildew**—Forms angular, eventually dead, brown spots in the leaves, often stunting or killing vines; most prominent just before melons ripen, later ones often not maturing or worthless because lacking flavor. It is questionable

whether this trouble can be controlled effectively and profitably by spraying during a very moist season. During dry or semi-moist seasons, however, results are satisfactory, so we recommend spraying as one of the regular operations of melon growing. It should be started soon after the vines begin to run, at least by the middle of July, and the vines should be kept covered with the Bordeaux to the end of the season. Rep. 1904, p. 329.

**Wilt**—See Squash:

## OATS

**Insects.**

**Army Worm**—See Grass.

**Fungi.**

**Smut**—Destroys the grain, turning it into a black, dusty mass of spores. Seed treatment is effective in preventing this smut. Either soak the seed 8 to 10 minutes in water at 132-5° F., or sprinkle thoroughly with formalin (formula A), stirring the grain so that it is thoroughly wet, and leave in piles for several hours before drying out.

## ONION

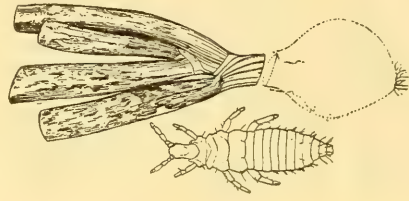
**Insects.**

**Thrips or "White Blast"**—A small insect which punctures the tissues and sucks out the sap, giving the field a whitish appearance. Spray with nicotine solution or kerosene emulsion. Reps. 1903, p. 266; 1913, p. 233.

**Maggot**—Infests the bulb of the young plant. Practice rotation of crops. Rep. 1911, p. 286.

**Fungi, etc.**

**Anthraxnose (Black Spot)**—Produces black circular spots on the bulbs, usually on white varieties after storing in the barn. Store onions as dry as possible and keep barn dry and cool. Avoid piling too deeply in the bins. Possibly air-slaked lime mixed with sulphur scattered over them



at time of storing may prove beneficial. See Stem Rot for treatment with formalin fumes. Fig. (A). Rep. 1889, p. 163.

**Brittle**—Causes very young seedlings in the field to die suddenly; others show irregular curling and yellow spotting of leaves. The cause of this trouble is not definitely known. It usually starts in fields in spots which enlarge year after year until the land is worthless for onions. Experiments indicate the value of treating the land, when the seed is sown, with formalin or with sulphur and lime, as for smut. Rep. 1906, p. 332.

**Smut**—Forms black dusty outbreaks on various parts of plants raised from seed; especially injurious to the very young seedlings. This fungus becomes established in the soil, hence infected land should be avoided or used only for transplanted onions. If, however, it is seeded, apply with the seed in drills, per acre, 100 lbs. sulphur thoroughly mixed with 50 lbs. air-slaked lime. Formalin (1 lb. or 1 pt. to 15 or 20 gallons water) thoroughly sprinkled over the seed by drip attachment to the seeder is an even more desirable remedy. Rep. 1889, p. 129; 1895, p. 176.

**Stem Rot**—Causes rotting of bulbs at stem end, where they become soft and shrunken, sometimes showing beneath the layers a dense olive-brown growth of mold. This fungus in a moist season occurs on various parts of the plant in the field, but does

not seem to cause serious trouble with the bulbs until some time after they have been placed in the barn. Treat same as for black spot. Treating bulbs with formalin fumes (see Fungicides) as soon as pulled, or at least as soon as stored, has been recommended as a possible preventive. Preliminary experiments by the writer show no injury to stored onions so treated, while the exposed spores were killed. Fig. (B). Reps. 1903, p. 334; 1904, p. 321.

## PEONY

### Insects.

**Rose Chafer**—Adult beetles feed upon blossoms of white varieties. See Grape.

## PEA

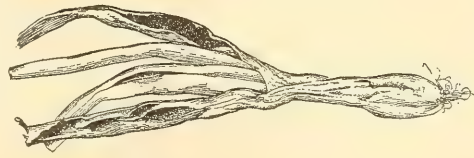
### Insects.

**Green Pea Aphis or Louse**—Attacks the plants early in June and sucks the sap from the leaves and stems, often causing great injury. Early peas may mature a crop before aphis injures them. Spray vines with nicotine solution and soap. Brush the vines just before cultivating. Reps. 1899, p. 240; 1913, p. 235.

**Pea-Weevil**—Like the bean weevil, this insect lays eggs in the pods in the field and the larvæ develop and transform in the seed, often breeding in stored peas. Fumigate with carbon disulphide.

### Fungi.

**Leaf Spot and Powdery Mildew**—The former shows as roundish spots on both pods and leaves; the latter, as a mealy



or cobweb-like coating on same. Neither seems to be sufficiently injurious here to warrant the expense of spraying.

## PEACH

### Insects.

**Peach Saw-Fly**—Larvæ defoliate trees in June and July. Spray with lead arsenate. Rep. 1907, p. 285.

**Peach Borer**—Larva tunnels in the base of the trunk. Dig out in late fall and early spring. Paint base of trunk with lead arsenate and lime-sulphur. Rep. 1909, p. 359.

**Fruit Bark-Beetle or Shot-Hole Borer**—Makes minute tunnels under the bark of branches and trunk. Burn infested trees and keep others thrifty. Rep. 1896, p. 240.

**Curculio**—See Plum.

**San José Scale**—Minute scale insects, with circular shell, which suck the sap from twigs, fruit and leaves. On fruit a red spot surrounds each insect. Spray dormant trees with lime-sulphur. Bull. 165; Rep. 1901, p. 240.

**Aphis or Louse**—Sucks the sap from the leaves. Spray with nicotine solution.

**Fungi, etc.**

**Brown Rot**—Occurs on the young



twigs, etc., but causes most serious injury to the fruit, rotting it about the time of its maturity. The rotten areas usually become covered with numerous pustules of dusty brownish spores; eventually the diseased fruits form hard mummies. These mummies carry the fungus over the winter, and if half buried in the soil develop in early spring the mature stage, which causes infection of the blossoms, etc. Certain early varieties, like Champion, etc., are especially subject to rot. Spraying these apparently pays in this state. See general directions for treatment. This fungus occurs also on plums and cherries and less commonly on pears and apples. Reps. 1900, p. 219; 1909-10, pp. 607, 612; 1911, pp. 374, 391.

**Crown Gall**—See Plum.

**Leaf Curl**—Causes young leaves to become irregularly curled and swollen and finally to drop off; rarely on fruit. In April, as soon as buds begin to swell, spray the trees thoroughly with commercial lime-sulphur, 1-9. Reps. 1909-10, pp. 608, 612; 1911, p. 374; 1914, p. 19.

**Scab**—Produces roundish, black-brown spots on the fruit, discolored areas on the young twigs, and rarely "shot-holes" in the foliage. Two treatments with self-boiled lime-sulphur or Atomic sulphur



upon the fruit after setting and when half grown (about the middle of May and June) will control this trouble. Reps. 1896, p. 269; 1909-10, pp. 608, 614; 1911, pp. 371, 391.

**Winter Injury**—Shows in various ways. In severe winters, especially when the ground is bare, the roots may be killed without injury to parts above ground. In spring such trees put forth a scanty, sickly foliage that soon drops. Sometimes the injury occurs in the form of a "collar girdle" in the bark at the base of the tree. Frequently it occurs above ground in the wood (shown by its blacker color), with or without injury to the bark. When the bark is not injured, severe pruning in spring will often save the trees. Nursery trees can sometimes be cut back to the snow line, below the injury, and an entirely new, healthy trunk started. Avoid late applications of nitrogenous fertilizers and cultivation after middle of July. Mulch base of young trees in late fall with vegetable or earth mulch. Secure good drainage. Reps. 1903, p. 341; 1908, p. 872.

**Yellows**—Causes premature ripening and red spotting of fruit, with yellowish, often curled leaves, and in time spindling sprout growths in bunches on the trunk. This is claimed to be a contagious disease, but is apparently physiological in nature. Root out and burn all trees as soon as found. Reps. 1893, p. 92; 1908, p. 872.

(1) Spraying of peaches while dormant is of value only in checking San José scale, mites and leaf curl. One application of commercial lime-sulphur, 1-9, just before the buds begin to swell in spring, the first part of April, will take care of all of these troubles at the same time. If the scale is unusually prevalent, a previous application in the late fall of lime-sulphur will prove of additional value in killing it.

(2) For the prevention of scab and rot of peaches, it is as a rule desirable to give three sprayings, as follows: 1st, shortly after the blossoms have fallen (May 10th to May 25th); 2d, about three or four weeks later (June 5th to June 15th); and 3d, about one month later (July 5th to July 15th). If only two sprayings can be given, omit the first if spraying only for rot, and the last if spraying only for scab.

(3) On the whole, self-boiled lime-sulphur of the 8-8-50 formula seems to be the safest and most reliable peach spray, and this is recommended. Good results have been obtained with some of the commercial lime-sulphurs, and they are much more easily handled. There is, however, some danger of spray injury, especially with certain brands. If commercial lime-sulphur is used, a strength of not greater than 1-150, without poison, is recommended. Atomic sulphur has given good results.

(4) As lead arsenate has done little to prevent curculio injury, and as it seems to increase the danger of spray injury, we advise leaving it out unless there is considerable danger of sawfly injury, when it can be added in the second spraying, the same as for apples.

## PEAR

Insects, etc.

**Brown-Tail Moth**—Brown hairy caterpillars feed on leaves, and make winter nests on twigs, maturing about the middle of June. Cut and burn winter nests. Spray foliage as soon as blossoms fall, and also in August, with lead arsenate. Rep. 1910, p. 683; Bull. 182.

**Fall Web-Worm**—Makes nests on ends of branches of many kinds of trees in late summer, the brown hairy caterpillars feeding inside the nests. Clip off and burn nests when small. Spray with lead arsenate. Rep. 1901, p. 270.

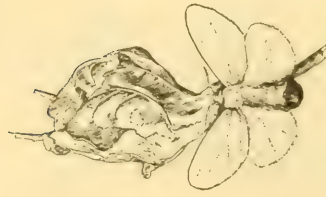
**Pear or Cherry Slug**—See Cherry. Spray with lead arsenate.

**San José Scale**—See Peach.

**Pear Psylla**—Small jumping plant lice suck sap from leaves and twigs, causing leaves to fall in midsummer. Spray with lime-sulphur in spring just before buds open. Spray infested trees with nicotine solution in July. Rep. 1903, p. 262.

**Pear Thrips**—A minute insect which feeds upon the unopened fruit buds, destroying them so that fruit does not set. Spray with nicotine solution just as buds open, and again after blossoms fall.

**False Tarnished Plant Bug**—Punctures developing fruit causing it to be irregular and knotty. Spray with nicotine solution and soap.



ing insects. Winter-prune all diseased branches, cutting off several inches *below* the diseased area. Cut out cankered areas and swab with disinfectant, paint exposed wood when dry. Several weeks after blossoming remove all young dead twigs. Use knife sterilized from time to time by wiping with a cloth saturated with carbolic acid or with corrosive sublimate (1-1,000). This disease occurs also on apple and quince. Rep. 1894, p. 113.

**Leaf Blight**—See Quince.

**Scab**—Forms olive-black, scabby spots on fruit and leaves, often causing the former to become distorted and cracked. The fungus lives over winter on the twigs. Certain varieties are not much injured;



others, like *Flemish Beauty*, are very susceptible. Spray with Bordeaux on unfolding leaves before blossoms open, again after petals fall, and give the third spraying about two weeks later, using weak Bordeaux in last two treatments. Reps. 1894, p. 135; 1904, p. 323; 1911, p. 396.

## PINE

### Insects.

**White Pine Weevil**—Adult snout beetle lays eggs on leader in May and grubs feed and develop in it, causing it to wilt and die in midsummer. Leaders of ornamental trees may be protected by spraying them with lead arsenate or lime-sulphur. Jarring the adults into a net once a week during month of May, serves to greatly reduce the damage. Infested leaders should be cut and destroyed. Rep. 1911, p. 307.

**Pine Leaf Scale**—Whitish pear-shaped shells on leaves; small trees sometimes killed. Spray with nicotine solution or kerosene emulsion about the second week in June. Bull. 151; Rep. 1905, p. 240.

**Pine Bark Aphis**—White cottony or woolly objects on bark and sometimes on leaves, sucking out the sap. Spray with kerosene emulsion. Rep. 1911, p. 343.

### Fungi, etc.

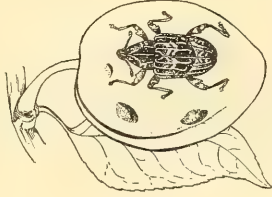
**Blight** (so-called)—Stunts the leaves and kills their tips inward, often suddenly, so that the tissues for a greater or less distance are reddish-brown. This is a physiological disease, not contagious; due to adverse weather conditions. Rep. 1909, p. 720.

**Stem Rusts**—Form on the swollen stems temporary, but conspicuous, white blister-like spore cups filled with a dusty orange-colored spore mass. The white pine rust, an imported species, spreads to the gooseberries and currants, and forms other less conspicuous leaf stages on these. A very similar native species spreads to the leaves of the sweet fern. In either case, infected pines should be destroyed, and watch kept of the alternate hosts, if they occur in the neighborhood. Seed beds should never be made in the vicinity of the alternate hosts, as infection takes place largely in the young pine seedlings. Send any suspicious white pines or their alternate hosts to this Station for examination. Rep. 1912, p. 347.

## PLUM

### Insects.

**Plum Curculio**—Grub infests the growing fruit, causing it to fall. Jarring the trees each morning for six weeks after blooming, and catching the beetles on sheets is probably the best remedy. Spraying with lead arsenate during the same period is also advised. Rep. 1910, p. 609.



**Fruit Bark-Beetle**—See Peach.

**San José Scale**—Spray dormant trees with lime-sulphur. Bull. 165; Rep. 1904, p. 221.

**Aphis or Louse**—Sucks sap from leaves. Spray with kerosene emulsion, nicotine solution or soap and water.

Fungi, etc.

**Black Knot**—See Cherry.

**Brown Rot**—Thin fruit so it does not touch. Gather and destroy all mummies after harvest. Rather difficult to control by spraying, as spray does not readily adhere to the smooth fruit. First treatment, with self-boiled lime-sulphur, should be made on half grown cherries, second 14 days later, and last 10-14 days before ripening. See Peach.

**Crown Gall**—Forms hard roundish knots one-half inch or more in diameter, near crown or on roots, less frequently on lower part of trunk. Do not plant infected trees. Remove knots when found and paint over cut surface. This is said to be very troublesome in some states, but here, as yet, little damage has resulted from it except possibly on blackberries and imported roses. It also occurs on peach, apple, raspberry, and various other plants.

## POTATO

Insects.

**Colorado Beetle**—Adults and larvae devour the leaves. Spray with lead arsenate as soon as injury is apparent. May be used in Bordeaux mixture. Rep. 1911, p. 311.

**Flea Beetle**—Adults eat the leaves. Use Bordeaux mixture containing lead arsenate. Rep. 1906, p. 271.

**Stalk-Weevil**—Tunnels inside the stalk. Burn infested vines.  
**Potato Aphis**—Spray with nicotine solution.

Fungi, etc.

**Blight or Downy Mildew**—Causes a sudden blackening of the leaves, and often death of vines, from July to September in moist seasons; usually shows a slight whitish growth of fungus on the under side of the leaves. Spray with Bordeaux before the trouble appears, about July 1st, and keep vines well covered to the end of the season. Three to five sprayings by hand or five to seven by power sprayer are necessary. After last cultivation thoroughly ridge up the rows to help keep the spores from washing down to the tubers. Early varieties often escape blight by maturing before its appearance. Reps. 1904, p. 363; 1905, p. 304; 1909-10, p. 739.



**Powdery Scab**—Differs from common scab by smaller, more nearly circular and often powdery spots, with epidermis elevated at margins. Recently imported into Maine, and occasionally brought here on seed potatoes. Inspection and quarantine now on in the infected districts. Soak seed in formalin as for common scab, and roll in sulphur afterwards. Send suspicious specimens to Station for examination. Fig. (A).

**Scab**—Produces the common *scabby* appearance on surface of tubers. Soak seed tubers one and one-half hours in formalin





(formula B.) Formalin fumes (see Fungicides) are often used when large quantities are treated. Care in filling space sufficiently, however, is necessary to avoid injury by "pitting" from absorption of fumes. Avoid planting on infected land, by systematic rotation. The use of lime, wood ashes, and various barnyard manures will increase the amount of scab. The same trouble occurs on beets and turnips. Fig. (B). Reps. 1890, p. 81; 1891, p. 153; 1894, p. 118; 1895, p. 166; 1896, p. 246; 1909-10, p. 744.

**Tip Burn**—Causes leaves to die at tip and margins and roll up; often mistaken for true blight. This is a physiological trouble due to drought or sudden change from moist to very hot bright weather. Cultivate thoroughly and often to conserve moisture. Spray with Bordeaux as for Blight, as this helps to increase yield by lengthening life of leaves.

## QUINCE

Insects.

**Round Headed Borer**—See Apple.

**Quince Curculio**—Grubs infest growing fruit and adults feed upon it causing it to be knotty. Jar the trees same as for plum curculio. Spray with lead arsenate.

**Green Aphis**—See Apple.

Fungi, etc.

**Black Rot**—Rots the fruit, often beginning at the blossom end; also kills twigs and branches. In the fall or spring cut off and burn all dead branches. Give three sprayings, as for Leaf Blight, with Bordeaux mixture.

**Blight**—See Pear.

**Leaf Blight**—Forms rounded, often confluent, reddish-brown spots with central black dots on leaves and fruit, the former often shedding prematurely and the latter cracking irregularly. Spray with Bordeaux just before blossoms open, again soon after they fall, and follow with 1 or 2 additional treatments at intervals of about 2 weeks, according to the weather. This fungus also occurs on pear. Reps. 1890, p. 99; 1891, p. 150.

**Rust**—Produces small clustered cups, with fringed borders and filled with orange spores, on fruit, young twigs and less frequently on leaves. Cut off and burn infected twigs and fruit. Treat as for apple rust.

## RASPBERRY

Insects.

**Raspberry Sawfly**—Larvæ devour leaves. Spray with lead arsenate or hellebore.

**Cane-Borer**—Cut and burn infested canes.

Fungi, etc.

**Anthraxnose**—Shows as more or less confluent whitish spots with purplish borders on the stems. In spring, before buds swell, cut out and burn all badly infected canes and then spray

with Resin Bordeaux. If disease is very bad, spray again when young shoots are about six inches high and repeat in 10 to 14 days. Aim chiefly to cover the young shoots with the spray. After fruit is gathered, again remove any badly infected canes. Cultivate ground thoroughly to promote vigorous growth of canes. Rep. 1899, p. 274.

**Rust**—See Blackberry.

**Wilt**—Forms cankered areas on the canes causing the parts above to wilt. In the old canes and near the pruned ends, the fungus often develops a brownish coating of spores around each small imbedded fruiting receptacle. The green berries often dry up without apparent cause, due to inoculation by insects. Spraying has not proved very satisfactory. Old and diseased canes should be removed and burned after the fruiting season and again early in spring. Rep. 1906, p. 321.

**Yellows**—Causes foliage to become more or less crinkled, and mottled with a sickly yellowish color. Plants gradually become worthless. Spraying does not seem to help this trouble, which apparently is of similar nature to peach yellows. Dig out plants with the yellows. Propagate only from perfectly healthy ones.

## RHODODENDRON

### Insects.

**Rhododendron Lace Bug**—This bug sucks the sap from the under side of the leaves, which are usually colored brown by its excrement. Spray with nicotine solution or kerosene emulsion. Rep. 1910, p. 708.

## ROSE

### Insects.

**Rose Scale**—Cut and burn worst infested canes. Spray with nicotine solution.

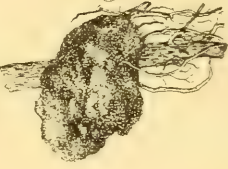
**Aphis or Green Fly**—Sucks sap from the leaves and stems. Spray with nicotine solution.

**Leaf-Hopper**—Sucks the sap from the under side of the leaves. Spray with nicotine solution.

**Rose-Slug**—Eats away the green portion of the leaves. Spray with hellebore, lead arsenate or nicotine solution.

**Rose-Chafer**—See Grape.

### Fungi, etc.



**Crown Gall**—Occurs very frequently on rose roots, especially imported ones on Manetti stock. Inspectors now destroy all infected stock. There is some question how much infected plants eventually suffer. See Plum. Rep. 1911-12, p. 355.

**Leaf Blotch**—Forms large purple-black blotches on leaflets, which often turn yellow and fall off. For greenhouse treatment paint hot water pipes with mixture of sulphur and oil. Potassium sulphide or commercial lime and sulphur can be sprayed on the foliage. Spraying out of doors can be done with Bordeaux, if there is no objection to the sediment on leaves. Rep. 1903, p. 355.

**Mildew**—Develops a white powdery or cobweb-like growth on the young leaves, which become more or less distorted and fall off.

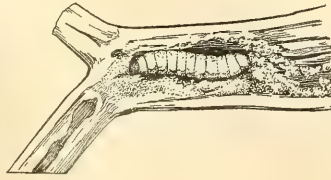
Treat same as for leaf blotch; or dust flowers of sulphur over the leaves; be careful in airing greenhouses. Rep. 1903, p. 356.

## SPRUCE

### Insects.

**Spruce Gall Louse**—Small plant lice form galls at the base of the new growth on Norway and other spruces. Spray in late fall or early spring with nicotine solution and soap. Rep. 1906, p. 302.

**Spruce Bud Moth**—Larva feeds on leaves of terminal shoots of the branches causing much damage. Spray with lead arsenate. Rep. 1912, p. 291.

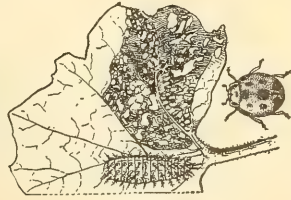


## SQUASH—PUMPKIN

### Insects.

**Squash-Vine Borer**—Tunnels in the base of the stem, causing decay. Cut slits in the stem longitudinally and kill the borers. Cover the joints of the vine with earth so that new shoots may be formed to support the plant. Grow a few early plants for traps, and destroy them. The main crop should be planted rather late. Rep. 1908, p. 806.

**Squash Lady-Beetle**—Both adults and larvæ devour the leaves. Spray with lead arsenate. Bull. 181, p. 11; Rep. 1908, p. 810.



**Squash Bug or "Stink Bug"**—Sucks the sap from the under side of the leaves, causing them to wilt and die. Spray with kerosene emulsion to kill the young. The old bugs may be trapped by placing boards or shingles on the ground, which should be visited each morning and the bugs killed. Rep. 1908, p. 811.

**Striped Beetle**—Devours leaves of young plants. Apply lead arsenate. See *Cucumber*.



### Fungi.

**Storage Rots**—Caused by various fungi that are best held in check by storage under conditions with minimum of heat and moisture.



**Wilt**—Causes leaves of the plants to wilt and then dry up, sometimes all of the vine thus suddenly dying. If a cross section of the stem shows a slight milky and sticky exudation, it is caused by bacteria that clog up the water ducts. Fungi in the ducts or insects at the roots may cause similar trouble. Heavy manuring often develops these troubles. Spraying is of little value, except as it may keep off insects which inoculate the plants with the bacteria. Use enough seed to allow for loss by wilt and pull up and destroy all the wilted vines as they appear. Rep. 1903, p. 359.

## STRAWBERRY

### Insects.

**Strawberry Sawfly**—Larvæ devour leaves. Spray with lead arsenate or hellebore.

**Strawberry Whitefly**—Sucks sap from leaves. Underspray with nicotine solution.

**Strawberry Weevil**—Small snout beetles; females cut off blossom buds of staminate varieties, when ovipositing. Plant pistillate varieties in part. Spray with lead arsenate.

**Strawberry Crown Borer**—Grub tunnels and feeds in crown of plant. Practice crop rotation. Burn over infested field in fall.

**Strawberry Flea Beetle**—Adults eat holes through the leaves. Spray with lead arsenate.

**Strawberry Leaf Roller**—Larva rolls leaf and feeds upon it. Spray with lead arsenate. Burn fields as soon as crop is harvested.

**Strawberry Root Louse**—Aphids suck sap from leaves and roots, killing plants. Set clean plants on land not infested. Spray with nicotine solution.

### Fungi.



**Leaf Spot and Blotch**—Cause conspicuous discolored spots, the former usually with whitish centers and purplish borders, and the latter with dark centers. Glen Mary sometimes severely injured by latter fungus. Renew the beds frequently.

In the late fall or early spring cut off leaves with mower, add a little straw where necessary, and burn over beds. Spraying with Bordeaux, once before blossoming and once to three times after fruiting season is over, is efficient, but is not used to any extent in this state. Reps. 1903, p. 360; 1913, p. 5.

**Powdery Mildew**—Covers leaves (more frequently on under, but more conspicuously, when present, on upper surface) with cobweb-like growth, often causing them to become stiff and curled inwards. When necessary, this can probably be controlled with Bordeaux, if sprayed before abundant. Rep. 1905, p. 276.

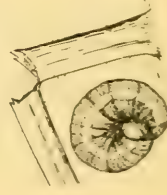
## TOBACCO

### Insects.

**Tobacco or Horn Worms**—Large green caterpillars with horn on the tail devour the leaves. Practice handpicking or spray the plants with lead arsenate. Rep. 1906, p. 269.

**Flea Beetle**—Adults eat holes through the leaves. Spray with Paris Green or lead arsenate in Bordeaux mixture. Rep. 1906, p. 271.

**Cut Worms**—Eat off plant near ground or climb the plant and devour the leaves. Place around field poisoned bait or bran mash containing arsenic. Trap cut worms with small piece of board. Rep. 1906, p. 264.



#### Fungi, etc.

**Calico**—Causes the leaves to become irregularly mottled with a lighter green color and makes a very inferior tobacco. Frequently infected leaves finally show numerous irregular, often merging, brown spots known as "rust." While calico is a physiological disease, due to injurious enzymes, it can be communicated to a healthy plant through contact with a very small amount of juice from a diseased plant. Care, therefore, is necessary after handling diseased plants in touching healthy ones. Never use tobacco water or tobacco stems on the seed beds. If calico shows in a seed bed, pull up all suspicious plants and those surrounding them. If troubled year after year, sterilize the seed beds or change them, and never make them on land used for tobacco the year before. When transplanting, wash the hands occasionally with soap and water. Reps. 1898, p. 242; 1899, p. 252; 1908, p. 857; Bull. 166, p. 10.



**Dampening Off**—Due to various fungi which rot off the seedlings close to the ground, causing them to fall over. Keep air of beds as dry as consistent with good growth by care in watering and ventilating. If trouble starts in spots, take out all infected plants and refuse there.

**Root Rot**—Shows in seed beds by dwarfed, "rosette" plants, whose roots have been largely rotted off. Occasionally it does more or less damage in fields, especially in alkaline or water-

soaked soils; a short rotation is advisable in such cases. Sterilize seed beds with steam or treat with formalin (formula C). Reps. 1906, p. 342; 1907, p. 363.

## TOMATO

### Insects.

**Cut Worms**—See Tobacco.

**Tomato Worm**—See Tobacco.

**Flea Beetle**—See Potato or Tobacco.

**White-Fly**—Found on the under side of leaves and here it sucks the sap. Spray under side of leaves with soap and water. Fumigate greenhouses with hydrocyanic acid gas (1 oz. to 1,000 cubic ft.). Bull. 140; Rep. 1902, p. 148.

### Fungi, etc.

**Leaf Spot**—Produces on leaves and stems numerous small dark spots, often with white centers. Begin spraying with Bordeaux about the middle of July, making 3 or 4 applications at intervals of 10-14 days. This usually develops too late in the season here to cause serious damage.

**Point Rot**—Causes the green fruit to rot at bloom end, showing a large, firm, dark brown area. Possibly caused by bacteria and fungi, but also claimed to be a physiological trouble. Frequently bad in very dry seasons. In greenhouses sub-irrigation is said to prevent it. Spraying,



apparently, is of little value. Considerable difference exists in varieties as to susceptibility.

**Scab**—Occurs most commonly in greenhouses, covering under surface of leaves more or less abundantly with an olive-brown growth which finally kills the tissue above. Spray with Bordeaux, picking ripe fruit before each of the later treatments.

## TULIP TREE

Insects.

**Tulip Tree Scale**—A brown hemispherical soft scale on bark, sucking the sap, especially on lower branches. Spray with lime-sulphur when trees are dormant. Bull. 151; Rep. 1905, p. 239; 1912, p. 294.

## TURNIP

Insects.

**Cut Worms**—See Tobacco.

**Maggot**—See Cabbage.

Fungi, etc.

**Club Root**—See Cabbage.

**Soft Rot**—Causes an interior soft decay of roots, etc., of a variety of vegetables, such as turnips, salsify, parsnip, carrots, celery, etc. Very wet seasons and imperfect storage conditions are usually the starting point of these troubles. Store under best possible conditions for keeping down heat and moisture. Keep contaminated refuse out of manure pile. Rep. 1913, p. 25.

**Phoma Rot**—Appears usually after storage, causing conspicuous, dry, sunken, subcircular, black spots scattered over roots. Fruiting pustules show as black dots. Store roots in cool, dry

place and not too deeply in the piles. Practice yearly rotation and keep refuse from manure pile. If necessary, use only artificial fertilizers. Rep. 1912, p. 355.

## VIOLET

Insects, etc.

**Violet Sawfly**—Larvæ devour leaves. Spray with lead arsenate or hellebore.

**Eel-Worms**—Form galls on the roots. Plant in new soil or sterilize the old soil by steam. Add plenty of air-slaked lime to the soil.

Fungi.

**Spot Disease**—Shows as whitish round spots on the leaves. Spray field plants early in fall with Bordeaux. Select only best stock for greenhouse; remove *all* affected leaves before transplanting. When plants become established, spray again with Bordeaux. Be careful about watering plants and, by proper ventilation and heat during September to November, keep atmosphere of house from ever becoming too moist.

## WATERMELON

Fungi.

**Anthracnose**—Shows as more or less abundant dark, sunken spots or areas on the fruit. Also infects leaves in spots.

Usually appears here too near end of season to cause sufficient injury to warrant spraying; spray also fails to adhere well to the fruit. Rotation and removal of rotting melons from field may possibly be helpful restrictive measures.



## MISCIBLE OILS

Several miscible oils are on the market, such as "Scalecide" and "Jarvis Compound." Are used to kill San José Scale, especially on old apple trees. Should be mixed 1 part in 15 parts water.

## NAPHTHALENE

Used in the form of moth-balls and "flakes" to keep clothes moths out of clothing. "Flakes" scattered around the borders of floors and shelves will drive away ants.

## FORMALIN FLY POISON

1 Tablespoonful Commercial Formalin

$\frac{1}{2}$  Cup Sweet Milk  $\frac{1}{2}$  Cup Water

Mix together and expose in a shallow plate with a slice of bread in it. Flies will drink the liquid and be killed, especially if no other moisture is accessible.

## HELLEBORE

Dust on the plants, or mix with water, 1 oz. in 2 gals. and spray. For currant-worm and other saw-fly larvae.

## CARBON DISULPHIDE

To kill insects infesting stored grain, in tight bins, use 1 lb. for 100 bushels of grain.

## COMMON SOAP

1 lb. in 8 gals. Water

Spray upon foliage to kill red spider, plant-lice and other sucking insects.

## POISONED BRAN MASH

25 lbs. Wheat Bran

1 lb. White Arsenic or powdered Lead Arsenate

2 qts. Cheap Molasses

Scatter around in field to kill cut-worms.

## HYDROCYANIC ACID GAS

1 oz. Potassium Cyanide

2 ozs. Sulphuric Acid. 4 ozs. Water

For each 100 cu. ft. Space

For dormant stock place the acid and water in an earthen jar in the house, drop in the cyanide and close the house at once for half an hour. Ventilate for ten minutes before entering. In greenhouse use 1 oz. of cyanide for each 1000 cu. ft. of space.

## KEROSENE EMULSION

2 gals. Kerosene  $\frac{1}{2}$  lb. Common Soap 1 gal. Water

Dissolve the soap in hot water, add the kerosene, and churn together until a white creamy mass is formed which thickens on cooling. Dilute nine times before using.

## OTHER BORDEAUX MIXTURES

**Dilute Bordeaux Mixture.** Use 1 lb. copper sulphate, 4 of lime, and make as above directed. For second and third sprayings of apples to lessen russeting of the fruit.

**Soda Bordeaux Mixture.** 4 lbs. copper sulphate,  $1\frac{1}{2}$  to  $1\frac{3}{4}$  lbs. soda lye, 50 gals. water. Use only enough lye to make the solution alkaline to test paper. Used sometimes for late spraying of grapes, etc., where spray sediment is objectionable.

**Resin Bordeaux Mixture.** Melt 5 lbs. resin with 1 pt. fish oil over fire, cool slightly, add 1 lb. soda lye with stirring. Add 5 gals. water and boil till the mixture will dissolve in cold water. Mix 2 gals. with 48 of Bordeaux mixture. Used sometimes on such glaucous plants as asparagus, cabbage, onions, etc., to make a more adhesive spray.

## POTASSIUM SULPHIDE

3 ozs. Potassium Sulphide 10 gals. Water

Used chiefly in greenhouses, or for powdery mildews.

## AMM. SOL. COP. CARBONATE

5 ozs. Copper Carbonate

3 pts. Ammonia 45-50 gals. Water

Use *just enough* ammonia (if strong, diluted with several volumes of water) to dissolve the copper carbonate; then dilute to final volume. This fungicide is not as good as Bordeaux, but is used where no sediment is desired on the foliage or fruit.

## COPPER SULPHATE

2 to 3 lbs. Copper Sulphate 50 gals. Water

Use only as a winter spray. 1 lb. to 250 gals. water is sometimes used on foliage. Now rarely used.

## COPPER LIME-SULPHUR

2 lbs. Copper Sulphate

$1\frac{1}{2}$  gals. Com. Lime-Sulphur 45-50 gals. Water

Dissolve copper sulphate in part of the water, and then add with the lime-sulphur to the remainder. Apparently a good fungicide but likely to russet apples as does strong Bordeaux.

## SULPHUR MIXTURE

Various commercial forms of Sulphur, such as "Atomic Sulphur" and "Sulphur Paste," have fungicidal value, and have been used by us for summer spraying of peaches with little or no injury at the rate of 8 lbs. to 45-50 gals. of water.

## FORMALIN FUMES

3 pts. Formalin 23 ozs. Potassium Permanganate

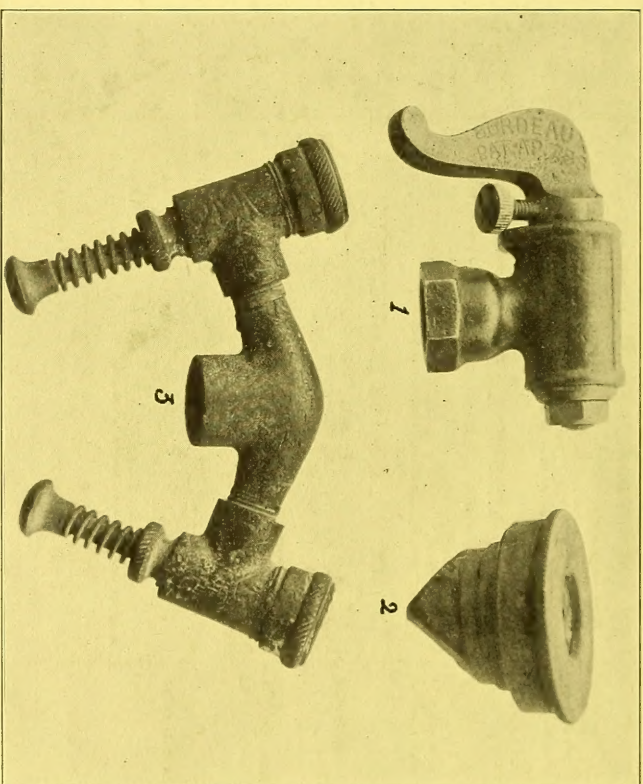
For each 1000 cu. ft. Space

Place bulbs or tubers in 6 to 12 in. crates so fumes can get at them. To prevent injury to potatoes, fill space at rate of 167 bu. Place formalin in large pail in cleared central space and drop in the crystals of potassium permanganate. Close room air-tight for 24 to 48 hrs.

## MANUFACTURERS OF INSECTICIDES AND FUNGICIDES

Adler Color & Chemical Co., 100 William St., New York, N. Y. (arsenical poisons)  
 Ansbacher & Co., A. B., 253 Broadway, New York, N. Y. (arsenical poisons)  
 Blanchard Co., Jas A., Hudson Terminal Building, New York, N. Y., (arsenical poisons and lime sulphur)  
 Bowker Insecticide Co., 43 Chatham St., Boston, Mass. (insecticides and fungicides)

(fungicides)  
 Jewell, Harvey, Cromwell (spray pumps)  
 Leete Co., The Chas. S., 299 State St., New Haven (wholesale druggists)  
 Lighbourn & Pond, 39 Broadway, New Haven (pumps, insecticides and fungicides)  
 Platt Co., The Frank S., 845-855 Dixwell Ave., New Haven (pumps, insecticides and fungicides)  
 Robertson Co., The J. T., Hilliard St., Manchester (miscible oils)  
 Sisson Drug Co., 727 Main St., Hartford (wholesale druggists)  
 Whittelsey Co., The Chas W., 261 State St., New Haven (wholesale druggists)



PLEASE SEND TO THE STATION SPECIMENS OF ALL UNFAMILIAR INSECTS AND PLANT DISEASES FOR IDENTIFICATION AND INFORMATION REGARDING INJURIES AND TREATMENTS



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